THIRTY-EIGHTH ANNUAL REPORT

FOR 1918-19

OHIO
Agricultural Experiment Station

WOOSTER, OHIO, U. S. A., JUNE, 1919

BULLETIN 338

The Bulletins of this Station are sent free to all residents of the State who request them. When a change of address is desired, both the old and the new address should be given. All correspondence should be addressed to EXPERIMENT STATION, Wooster, Ohio.

Thirty-Eighth Annual Report

OF THE

Ohio Agricultural Experiment Station

For the Year ended June 30, 1919

Published by the order of the State Legislature

WOOSTER, OHIO
EXPERIMENT STATION PRESS
1919

HON. JAMES M. COX,

Governor of Ohio:

SIR: I have the honor to transmit herewith the Thirty-Eighth Annual Report of the Ohio Agricultural Experiment Station, for the year ended June 30, 1919.

G. E. JOBE,

President of the Board of Control

Wheat harvest on the Ohio Experiment Station Farm

OHIO AGRICULTURAL EXPERIMENT STATION

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AGRONOMY

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F. A. WELTON, M. S. ..... Associate
J. B. PARK, Ph. D.[1] ..... Associate (Ohio State University, Columbus)
WILLIAM HOLMES ..... Farm Manager
C. A. PATTON ..... Assistant
L. E. THATCHER, Ph. G. ..... Assistant
C. H. LEBOLD ..... Assistant Foreman

ANIMAL HUSBANDRY

B. E. CARMICHAEL, M. S., *Chief* ..... Beef Cattle and Horses
J. W. HAMMOND, M. S., *Associate* ..... Sheep and Wool
W. J. BUSS, *Assistant* ..... Poultry
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WAYNE VAN PELT, B. S., *Assistant* ..... Field Crop and Vegetable Diseases
FREDA DETMERS, M. S. ..... Assistant

CHEMISTRY

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C. J. SCHOLLENBERGER ..... Assistant
MABEL K. CORBOULD, *Assistant* ..... Milling and Baking Technology
RAUB H. SIMON, A. M. ..... Assistant

CLIMATOLOGY

W. H. ALEXANDER[1] ..... Climatologist (Columbus)
C. A. PATTON ..... Observer

DAIRYING

C. C. HAYDEN, M. S. ..... Chief
A. E. PERKINS, M. S., *Assistant* ..... Dairy Chemistry
W. E. VORDERMARK ..... Office Assistant

ENTOMOLOGY

H. A. GOSSARD, M. S., *Chief* ..... Insects in Relation to Vegetable Diseases
HERBERT OSBORN, M. S.[1] ..... Associate
J. S. HOUSER, M. S. A., *Associate* ..... Forest, Shade Tree and Scale Insects

FORESTRY

EDMUND SECREST, B. S. ..... Chief
J. J. CRUMLEY, Ph. D. ..... Assistant
J. W. CALLAND, B. S.[3] ..... Assistant
RUTH E. MCCOY ..... Office Assistant
SCOTT HARRY ..... Foreman of Nursery

HORTICULTURE

W. J. GREEN, *Vice Director* ..... Chief
F. H. BALLOU, *Assistant* ..... Cooperative Experiments (Newark)
PAUL THAYER, M. S. ..... Assistant
C. W. ELLENWOOD ..... Field Assistant
I. P. LEWIS ..... Field Assistant
ORA FLACK ..... Foreman of Orchards
W. E. BONTRAGER ..... Foreman of Grounds
C. G. LAPER ..... Foreman of Greenhouses

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E. B. FORBES, Ph. D. ..... Chief
J. O. HALVERSON, Ph. D. ..... Assistant
J. A. SCHULZ, B. S. ..... Assistant
E. B. WELLS, B. S. ..... Assistant

SOILS

THE DIRECTOR ..... Chief
C. G. WILLIAMS ..... Associate
J. W. AMES, M. S, *Associate* ..... Soil Chemistry
FIRMAN E. BEAR, Ph. D.[1] ..... Associate (Columbus)

DIVISION OF SOIL TECHNOLOGY

E. R. ALLEN, Ph. D.[4] ..... Associate in Charge
B. S. DAVISSON, A. M., *Assistant* ..... Soil Biology
G. W. CONREY, A. M., *Assistant*[1] ..... Soil Survey (Columbus)
A. BONAZZI, B. Agr., *Assistant* ..... Soil Biology

FARM MANAGEMENT

C. W. MONTGOMERY ..... Chief
G. P. BECKER ..... Office Assistant

DISTRICT EXPERIMENT FARMS

Northeastern Test Farm, Strongsville
W. H. RUETENIK, *Foreman*

Southeastern Test Farm, Carpenter
S. C. HARTMAN, *Superintendent*

Southwestern Test Farm, Germantown
HENRY M. WACHTER, *Superintendent*

Northwestern Test Farm, Findlay
JOHN A. SUTTON, *Superintendent*

COUNTY EXPERIMENT FARMS

Miami Co. Experiment Farm, Troy
Madison Co. Experiment Farm, London
R. R. BARKER, B. S., *Supt.*, London, O.

Washing Co. Experiment Farm, Fleming
Washington Co. Truck Experiment Farm, Marietta
S. C. HARTMAN, M. S., *Supt.*, Marietta

Paulding Co. Experiment Farm, Paulding
H. R. HOYT, *Supt.*, Wooster

Mahoning Co. Experiment Farm, Canfield
Trumbull Co. Experiment Farm, Cortland
J. PAUL MARKLEY, *Supt.*, Canfield

Clermont Co. Experiment Farm, Owensville
Hamilton Co. Experiment Farm, Mt. Healthy
H. W. ROGERS, *Supt.*, Mt. Healthy

Belmont Co. Experiment Farm, St. Clairsville
C. W. MONTGOMEY, *Acting Supt.*, Wooster

STATE FORESTS

Waterloo State Forest, New Marshfield
JOHN WITHERS, *In Charge*

Dean State Forest, Steece
G. C. MARTIN, *In Charge*

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[1]In cooperation with College of Agriculture, Ohio State University.
[2]In cooperation with the U. S. Department of Agriculture.
[3]On leave of absence.

ANNOUNCEMENT

The Ohio Agricultural Experiment Station is organized under an act of the General Assembly of Ohio, passed April 17, 1882, and supplemented by an act of Congress, approved March 2, 1887.

WHAT THE STATION CAN DO

The Station offers its advice and assistance to the farmers of Ohio along the following lines:

The maintenance of soil fertility, including the rotation of crops and the selection and use of manures and fertilizing materials.

The selection of varieties of grains, grasses and forage crops and methods of culture.

The selection of varieties of fruits and vegetables and the management of orchards.

The examination of seeds that are suspected of being unsound or adulterated; the identification of grasses, weeds and other plants; the prevention of fungous diseases of plants.

The identification of insects and the control of such as are injurious.

The feeding of animals, including calculation of rations and use of various feeding stuffs.

The planting and care of forest trees and the managemnet of farm woodlots.

Visitors to the Station or its various test farms are welcome at all times during business hours. Persons or parties who contemplate such visits and who desire special attention are requested to write in advance, giving date of proposed visit and probable number of party.

Any citizen of Ohio has the right to apply to the Station for such assistance as it can give, and all such requests will receive prompt attention.

The bulletins of this Station are sent free to all residents of the State who request them.

WHAT THE STATION CANNOT DO

For advice and assistance along the following lines, application should be made to the Ohio State Board of Agriculture, Columbus, not to the Experiment Station.

The analysis of commercial fertilizers, of lime or limestone for agricultural purposes, and of feeding stuffs.

The treatment of contagious diseases of animals.

The inspection of orchards and nurseries for the control of San Jose scale.

The examination of foods, drugs, and dairy products suspected of being adulterated.

The Station is not prepared to analyze drinking water; requests for such analysis should be addressed to the Secretary of the State Board of Health, Columbus.

Address all communications to

Experiment Station,

Wooster, Ohio.

REPORT OF THE DIRECTOR

HON. G. E. JOBE,

President of the Board of Control.

Sir: I have the honor of presenting the thirty-eighth annual report of the Ohio Agricultural Experiment Station, for the year ended June 30, 1919.

THE FINANCIAL SITUATION

The close of the European war has not yet been followed by any reduction in the cost of the material and supplies required for the Station's work, while there has been a further advance in the rate of wages. Since the appropriations for the support of the Station were based upon values and wages current before the war, it has been necessary to curtail some lines of work.

Under the present system of appropriations by the legislature of this State a lump sum is appropriated for wages, while the appropriations for salaries are made for individual positions. The result of this system is that a rise in the scale of wages may be met by reducing the number of laborers and increasing the pay of those who remain; but if a salaried man drops out the only alternative is to put another man in his place at the same salary or allow his salary to lapse into the State Treasury; it cannot be used for the increase of salaries of those who remain at their posts.

The outcome of this system is that the Ohio Experiment Station has become a training field for the benefit of other institutions, and that when a man has achieved the experience that makes him most useful to this Station he is called away by institutions or business opportunities that are not subject to such restrictions.

This Station has lost forty-seven members of its scientific staff and foremen during the last 3 years, because it could not meet this condition. The consequence is that important lines of work must be abandoned, both because men with the scientific training necessary to efficient leadership in such work cannot be retained, and because the money appropriated for wages of the laborers necessary to the execution of such work must be divided among fewer men.

DEPARTMENTAL ORGANIZATION

The Department of Animal Husbandry at this Station was organized in 1905, the work with livestock having previously been included with that on farm crops in a department of agriculture.

In 1906 the Adams Act was passed, and thus a fund was made available for more profound and recondite lines of research than had generally been undertaken. In my report for the year 1906-07 I called attention to the need for more thorough investigation than had yet been undertaken with respect to the possible relation, which the supply of mineral elements in the food and the form in which these elements are carried in the food materials, may have to nutrition and possibly also to health, and to the fact that the system of agriculture in Ohio has been such as to result in a relative exhaustion of the element phosphorus from the soils of the State, and stated that a Department of Nutrition had been organized in the Station for the purpose of endeavoring to learn more about the effect on the animal organism of feeding upon the produce of soils thus deprived, the work of this department to be directed chiefly to a study of the function of the mineral elements and phosphorus in particular in nutrition.

As this was a comparatively new field of research in agriculture it was necessary on the one hand to make available the information already extant, and on the other, to develop new methods of research, using this information as a basis.

The first task involved the compilation of a bibliography of phosphorus metabolism and the abstracting of such portions of that literature as seemed to have a direct bearing on the problem in hand. This was done by an examination of the literature on the subject as found in the principal scientific libraries of the Nation and was reported in Technical Bulletin No. 5 of this Station, a volume of 748 pages.

The second task has involved 10 years of elaborate experimentation in the feeding of animals under conditions of the most rigid control possible, including chemical analyses of the foods consumed, of the excreta, and of the carcass, the chemical work attendant on a feeding experiment in some cases occupying several chemists for a year or more.

By the close of 1918 the work had reached a point at which it was necessary to carry it to the feeding barn, for experience has shown that the work of the experiment station cannot stop short of demonstration under the actual conditions of the farm if it is to accomplish its purpose.

The conditions at that time existing at this Station were such that the unity of operation necessary to the successful execution of this larger work could only be attained by consolidating the departments of Nutrition and Animal Husbandry under a single head, and such consolidation was ordered by unanimous action of the Board of Control on January 15, 1919, the two departments of Nutrition and Animal Husbandry being abolished, and a department of Animal Industry created in their stead.

This order was made effective February 1, 1919, but on January 31 the chief of the department of Animal Husbandry obtained an order from the local court temporarily restraining the Director and the Board of Control of the Station from carrying it into effect, and the case had not been tried at the close of the fiscal year.

INVESTIGATIONS IN PROGRESS

The principal subjects listed in the four preceding annual reports are still under investigation, though many of them are temporarily discontinued because of insufficient funds. The actual work of the year is summarized below:

AGRONOMY

A few lines of investigation in corn and oat breeding, temporarily suspended on account of the war, have been resumed. Most of the lines of work noted in previous annual reports are being continued and valuable data are being accumulated for early publication.

The following investigations not heretofore reported are now in progress:

72. **Mulching winter wheat** with different amounts of straw per acre during the late fall or early winter.

73. **Clipping winter wheat** in the spring at different heights when it has attained a growth of 8 to 10 inches.

Publications.—During the the past year the following articles have been published in the *Monthly Bulletin*: "Cover Crops for Fall Planting" (July, 1918), F. A. Welton; "Date and Rate of Seeding Wheat" (September, 1918), C. G. Williams; "Selection and Care of Seed Corn" (October, 1918), C. G. Williams; "Storage of Seed Corn" (December, 1918), F. A. Welton; "How much Manure May Be Produced per Acre" (December, 1918), C. G. Williams; "Spring Seeding of Clover and Grass" (March, 1919), C. G. Williams; "Pea and Oat Hay" (March, 1919), L. E. Thatcher; "Spring Wheat in Ohio" (March, 1919), C. G. Williams; "Growing Rape for Summer Forage" (April, 1919), F. A. Welton; "Sudan Grass as an Ohio Crop" (May, 1919), C. G. Williams.

ANIMAL HUSBANDRY

In this department B. E. Carmichael, the chief, has retained immediate control of the work with horses and cattle, while to J. W. Hammond has been assigned the work with sheep, to W. L. Robison that with swine, and W. J. Buss that with poultry. No report on work with horses or cattle has been presented since 1908. The work of the other divisions has been brought up to date by the publications named below:

Publications.—Bulletin 335, "Effect of Age of Pigs on the Rate and Economy of Gains," W. L. Robison. *Monthly Bulletin*: "Hogging Down Corn" (August, 1918), W. L. Robison; "Amounts of Protein for Laying Hens" (September, 1918), W. J. Buss; "Feeding Swine During Fall and Winter" (November, 1918), W. L. Robison; "Effect of Date of Hatching Upon Egg Production" (March, 1919), W. J. Buss; "Rape Pasture for Swine" (April, 1919), W. L. Robison; "Green Forage Crops for Lambs" (April, 1919), J. W. Hammond; "Methods of Feeding and Feeds for Chicks" (May, 1919), W. J. Buss; "Effect of Age or Weight of Pigs on Economy of Gains" (May, 1919), W. L. Robison; "Hogging Down Rye" (June, 1919), W. L. Robison.

BOTANY

The work of the department has included the following items:

1. **Weeds.**—A large number of specimens have been received, seeking name and advice as to eradication.

2. **Commercial seed examinations** continued during the year, probably to be suspended when the new seed law goes into effect.

7. **Diseases of field crops.**—(a) Tests of methods of seed treatment of wheat were made. Special studies of the anthracnose disease of cereals are being made in relation to disease survival from season to season. Counts of percentages of different diseases of wheat and oats are being made. Cooperation with the Bureau of Plant Industry, United States Department of Agriculture, in barberry eradication work, was maintained. Also special field trips were made to locate new diseases of wheat.

(b) Studies have been made as to the occurrence and injuries from diseases of clovers and alfalfa.

(c) Field studies of the occurrence and losses from corn root rot have been made.

8. **Diseases of vegetables.**—(b) Cooperation has been continued in Departments of Horticulture and Botany for breeding strains of cabbage resistant to Yellows diseases, and of tomatoes resistant to fusarium wilt.

(d) Organization was maintained in 1918 for the certification of seed potatoes.

9. **Tobacco investigations.**—(a) Cooperation was continued with tobacco growers in Montgomery County to secure steaming of tobacco beds for prevention of root rot.

(b) Results of breeding work on tobaccoes have been used through distribution of seed of the new kinds.

10. **Plant disease survey.**—Cooperation in this survey with the Bureau of Plant Industry now calls for increased labor and various reports. Through

this work cooperation is maintained with other branches of government work in food conservation and disease control in crops.

Publications.—Bulletin 333, "Apple Blotch, a Serious Fruit Disease," A. D. Selby; *Monthly Bulletin*: "Clover Diseases in Ohio" (August, 1918), Wayne Van Pelt; "Treating Seed Wheat" (September, 1918), A. D. Selby; "Root Rot of Corn" (October, 1918), A. D. Selby; "Are There Barberry Bushes On Your Farm?" (December, 1918), D. C. Babcock; "Onion Diseases Found in Ohio" (March, 1919), Wayne Van Pelt; "Oat Smut Control" (March, 1919), Wayne Van Pelt; "Apple Blotch" (May, 1919), A. D. Selby; "Brief Notes on Tomato Diseases" (June, 1919), Wayne Van Pelt. Published in Scientific Journals: "Plant Breeders Find New Tobacco Hybrid," Journal of Heredity, Vol. IX, No. 8, December, 1918, True Houser. "Diseases of Shade Trees and Shrubbery," Park and Cemetery Magazine, D. C. Babcock.

CHEMISTRY

The following statement covers the projects outlined in the annual reports from 1914-15 to date:

1. **Availability of phosphorus supply of calcareous and non-calcareous soils.**—In studying this subject a large number of soils from different sections of the State have been collected and analyzed to determine the relation between total and dilute-acid-soluble phosphorus, and basic calcium and magnesium compounds, organic matter and nitrogen content.

Soils selected from those analyzed have been used in pot tests for the growing of wheat and other crops; the object being to determine whether there is any correlation between the phosphorus content of the soil and the phosphorus assimilated by the crops on the different soils.

So far the growth of crops in this experiment has not been sufficiently satisfactory for definite conclusions to be drawn.

The work is being actively continued.

2. **A chemical study of the wheat crop growing on differently treated soils.**—A report of this work was made in Bulletin 318, "Relation of Phosphorus and Nitrogen in Soil to the Composition of Wheat," by J. W. Ames and G. E. Boltz.

3. **Capacity of nitrogen-fixing bacteria to convert insoluble phosphates into available organic phosphorus compounds.**—This work was discontinued because it was found to be impossible to maintain properly controlled conditions as to inoculated and non-inoculated soil for legumes grown in pot tests.

4. **Phosphorus absorption.**—Discontinued on account of resignation of chemist who had taken up this subject.

5. **Sulphur requirement of soils.**—Subject changed later to sulphur requirements of soils and crops. A report of this subject was made in Bulletin 292, by J. W. Ames and G. E. Boltz.

6. **Changes produced by liming the soil.**—Report made in Bulletin 306, "Liming and Lime Requirements of Soil," by J. W. Ames and C. J. Schollenberger.

7. **Peat soil.**—Conditions on several unproductive peat areas have been investigated at different times during the past few years and advice given concerning fertilizing and treatment. Pot tests and analyses of peat and muck soils have been made. Partial analyses of peat soils are given in the Monthly Bulletin for May, 1919.

8. **Effect of soil treatment on quality of tobacco.**—Reported in Bulletin 285, "Influence of Fertilizers on Composition and Quality of Tobacco," by J. W. Ames and G. E. Boltz.

9. **Milling and baking technology.**—Several articles pertaining to this work have appeared in the Monthly Bulletin. Bulletin 341, "Wheat, Flour and Bread," by Mabel K. Corbould, is ready for publication.

10. **Miscellaneous chemical analyses.**—Work of this nature is continually being done for other departments of this Station.

11. **Chemical examination of the principal soil types of the State.**—Partial report was made in papers recently submitted to Jour. Agr. Research (1919). "Partial Analyses and Classification of Ohio Soils," by E. R. Allen and J. W. Ames.

Soil studies.—Changes in nitrogen content of soils treated with fertilizers and manure. Systematic sampling and analyses of soils from fertility plots have been carried on and considerable data obtained. Some of these data were used in Bulletin 305.

Soil acidity.—Effect of fertilization on lime requirement of soil. Comparison of limestone of different grades of fineness; study of methods for determining lime requirements of soils; study of factors contributing to soil acidity. These subjects were treated in Bulletin 306, "Liming and Lime Requirement of Soils," by J. W. Ames and C. J. Schollenberger.

Sulphur in relation to soils and crops.—Reported in Bulletin 292, by J. W. Ames and G. E. Boltz.

Nitrogen studies.—Effect of reenforcing materials on availability and conservation of nitrogen in manure. This subject is discussed in a paper on "Fermentation of Manure Treated With Sulphur and Sulphates," by J. W. Ames and T. E. Richmond, in Soil Science, Vol. IV, No. 1, July, 1917.

12. **Loss of nitrogen from clover incorporated with and spread on surface of soil.**—Reported in Monthly Bulletin for November, 1916, "Loss of Organic Matter in Green Manuring," by G. E. Boltz.

Report of a second experiment on this subject was made in the Monthly Bulletin for December, 1917, by G. E. Boltz and C. J. Schollenberger, and in Journal American Society of Agronomy, Vol. X, No. 5, by G. E. Boltz.

14. **Relation between sulfofication, nitrification and ammonification** on acid and basic soils. Reported in Soil Science, Vol. IV, No. 1 (July, 1917), by J. W. Ames and T. E. Richmond.

15. **Solubility of phosphorus** by combined effects of sulfofication and nitrification. Reported in Soil Science, Vol. VI, No. 5, p. 351 (November, 1918), by J. W. Ames and T. E. Richmond.

16. **Soil constituents attacked by acidity** resulting from sulfofication and nitrification. Report sent to Soil Science for publication, by J. W. Ames and G. E. Boltz.

Subjects 14, 15 and 16 are also more fully reported in Bulletin 344, recently prepared.

An additional cooperative investigation on composting floats with soil and manure was carried on under the direction of a committee appointed by the National Research Council of the Council of National Defense. Extensive experiments were conducted during 1917-1918 and a report was submitted to Dr. J. B. Lipman, chairman of the committee.

Additional papers concerning other phases of soils than those mentioned in annual reports have appeared in Monthly Bulletins and other publications.

Some of the investigations outlined in previous reports have been actively continued and data presented.

Papers on the composition of representative types of Ohio soils, and the calcium and magnesium content of virgin and cultivated soils have been finished and submitted to the Journal of Agricultural Research.

Other investigations in addition to those outlined in previous reports and not completed, are the following:

17. **Influence of various silicates** on crop growth and utilization of phosphates.

18. **Organic phosphorus in soils;** development of methods for determining.

Publications, 1918-1919.—*Monthly Bulletin*: "Analysis of County Limestone Deposits" (July, 1918), J. W. Ames; " 'Over the Top' in Baking" (October, 1918), Mabel K. Corbould; "Ohio Spring Wheat Retains Gluten Properties" (February, 1919), Mabel K. Corbould; "Peat and Muck Soils" (May, 1919), J. W. Ames. Scientific Journals: "The Organic Phosphorus of the Soil," Soil Science, Vol. VI, No. 5, p. 365, C. J. Schollenberger; "Effect of Sulfofication and Nitrification on Rock Phosphate," Soil Science, Vol. VI, No. 5, p. 351, J. W. Ames and T. E. Richmond; "Effect of Sulfofication and Nitrification on Potassium and Other Soil Constituents," Soil Science, Vol. VII, No. 3, p. 183, J. W. Ames and G. E. Boltz; "The Solvent Action of Dilute Nitric Acid and Citric Acid on Rock Phosphate," Journal of Industrial and Engineering Chemistry, Vol. XI, No. 3, p. 224, J. A. Stenius.

CLIMATOLOGY

The work of this department has included the collecting and tabulation of records of rainfall and temperature at the central station and several of the outlying farms, and the preparation of the annual report on "Ohio Weather" (Bulletin 337).

Publications: Bulletin 337, "Ohio Weather for 1918," W. H. Alexander and C. A. Patton. *Monthly Bulletin*: "Weather Conditions During the Season of 1918" (December, 1918), C. A. Patton.

DAIRYING

Most of the work in this department has been planned to cover a considerable period of time. Following are some of the principal problems under investigation:

1. **Wide, medium and narrow rations for dairy cows.**—This work started with six cows in 1911, the plan being to continue these cows and a part of their female progeny on similar rations. Difficulties have been encountered in the way of failure to breed and persistence in dropping male calves. At present but two of the original cows remain in the test, one in the wide and one in the narrow ration group. These, with their descendents, make nine animals now in the test, but it has been necessary to discontinue the medium ration group.

In so far as can be seen at present the lack of protein has had no detrimental effect on the growth of the animals, but it does reduce the flow of milk.

2. **Comparison of alfalfa and clover in milk production.**—The results thus far attained have been published in Bulletin 327 (1918). The work will be continued with other legumes when opportunity offers.

3. **The cost of raising dairy heifers.**—Additional data on this subject were published in Bulletin 334, "Dairy Production in Ohio." Further data are being accumulated.

4. **The composition of milk and milk fat.**—This work has made little progress because of insufficient help in the laboratory, the assistant in charge of this and related work (Mr. Grady) having accepted a more remunerative position during the year.

5. **Effect of inbreeding.**—This work is progressing slowly. Thus far the indications are that the general result is a reduction in the size and productive capacity of the animal, although there are some exceptions.

6. **Cost of milk production.**—This work has been conducted in cooperation with dairymen and a part of the data collected have been published in Bulletin 334. For the present this work has been discontinued.

7. **Calf rations.**—This work has been suspended because of insufficient help to conduct it properly.

8. **Corn silage.**—A comparison of silage from field corn and from the large ensilage corn, has been conducted in cooperation with the Department of Agronomy. Thus far the results seem slightly to favor the use of field corn (Clarage) but the work is to be continued.

9. **Herd improvement.**—This work is being continued at the central Station and, in cooperation with the Department of Farm Management, at some of the county experiment farms. It will necessarily require several years to reach definite results.

Other lines of work have had to be suspended because of insufficient help, both in the stable and the laboratory, the shortage of help having at times been so acute as to make it necessary for the chief and his laboratory assistants to take part in the work of the stable.

Publications.—Bulletin 334, "Dairy Production in Ohio," R. I. Grady and M. O. Bugby. *Monthly Bulletin:* "How to Determine the Cost of Milk" (December, 1918 and January, 1919), C. C. Hayden; "Centrifugal Recovery of Cheese from Buttermilk" (December, 1918), A. E. Perkins.

ENTOMOLOGY

Two members of the staff of this department were absent on leave during the year in military service and others were drawn to other states which were able to offer higher salaries, so that it has not been possible to maintain the former scale of activity.

At the beginning of the year the work in animal parasitology, under D. C. Mote, was transferred at his request from the department of Animal Husbandry to that of Entomology. Soon afterward, however, Mr. Mote resigned in order to accept an offer of a much higher salary in another state, and consequently this line of work has been discontinued.

Of the lines of work previously listed the following have had attention during the year:

3. **Distribution of periodical cicada.**—Records of the distribution of the periodical cicada in 1919 over western Ohio have been provided for and are in process of collection.

6. **Long-time spraying of orchards.**—A 10-year spraying test in the Starcher orchards, Gallia County, was completed in 1918. This was the last of three similar tests to be finished. The results of the three tests have been published in the Monthly Bulletin for May, June and July, 1919, respectively.

9. **Insect control on city shade trees.**—A special investigation on insects affecting shade and ornamental trees has been completed and a comprehensive bulletin on this subject has been printed.

10. **Tests of insecticides.**—Experiments are being conducted at Wooster and Geneva, Ohio, to determine the comparative merits of the newer insecticides.

In addition to lines of work previously enumerated Professor Herbert Osborn, Associate Entomologist, is preparing a bulletin on "Insects Affecting Pastures and Forage Crops," which summarizes his studies on insects of this character for a quarter of a century; an investigation of insects affecting truck and vegetable crops has been commenced and a laboratory established at Marietta for this purpose, and experiments for the control of the apple flea weevil have been undertaken at Delaware.

Publications.—Bulletin 329, "The Peach Tree Borer," H. A. Gossard and J. L. King; Bulletin 332, "Forest and Shade Tree Insects in Ohio," J. S. Houser. *Monthly Bulletin*: "Grasshoppers and Methods of Control" (July, 1918), T. L. Guyton; "Controlling the Midge in Ohio Wheatfields" (August, 1918), H. A. Gossard; "Stalk Borers" (August, 1918), T. L. Guyton; "Flea-Beetles as Pests of the Garden" (August, 1918), J. R. Stear; "The Wheat-Insect Survey of 1918" (September, 1918), H. A. Gossard; "Fall Practices to Destroy Cereal Crop Insects" (November, 1918), T. H. Parks; "Preparing for Aphid Outbreak" (March, 1919), H. A. Gossard; "Seventeen-year Locusts Due in Western Ohio" (April, 1919), H. A. Gossard; "Decade Records of Ohio Apple Orchards" (May, June and July, 1919), H. A. Gossard; "The European Corn Borer" (June, 1919), J. S. Houser; "Controlling Asparagus Beetles" (June, 1919), T. L. Guyton.

FARM MANAGEMENT

The work on the district and county experiment farms has been continued as outlined in previous reports.

Because of the difficulty in obtaining labor, a difficulty that has increased instead of diminishing since the signing of the armistice, no new project has been undertaken, and the high price of material has made it difficult to complete the improvements necessary to the effective working of the farms.

Permanent improvements have been made as follows: Dwellings for foremen have been built on the Madison and Clermont County farms; a combined office, shop and garage with seed room overhead has been built at the Paulding County farm, and a combined manure shed, tool shed and corncrib at the Northeastern Test

Farm; 1,738 rods of tile drain have been laid at the Madison County farm; 575 rods at the Miami County farm; 302 rods at the Paulding County farm, and the ditching machine is at work at the Washington County farm.

Considerable ornamental planting has been done on all the farms.

Cost account data are being collected on several of the farms, but lack of sufficient help has prevented the doing of much investigational work outside these farms.

Publications.—Bulletin 323, "County Experiment Farms in Ohio," is the annual report of these farms for 1916 and 1917. Bulletin 336 reports the fertility studies on the District Experiment Farms at Strongsville, Germantown, Carpenter and Findlay up to 1918. *Monthly Bulletin*: "Lessons from the Northeastern Test Farm" (April, 1919) and "Lessons from the Southeastern Test Farm" (June, 1919), C. W. Montgomery.

FORESTRY

The following lines of work have been carried forward by this department during the year:

1. **Propagation of forest trees.**—(a) Fertilization. This work is being continued as outlined in the last annual report. To date no marked differences are shown on the white pine seed beds at Wooster from the application of chemical fertilizers carrying the fundamental elements. It is planned to extend this work to the two State Forests, where different classes of soils exist.

2. **Reforestation.**—Methods of planting forest trees, adaptability of species for commercial plantations and costs of operations are under investigation.

3. **Forest arboretums.**—This work is being conducted on State, private and municipal lands for the purpose of more intensive investigations relative to the value of different species for reforestation in pure planting, mixtures, spacing and behavior on different soils and sites.

4. **Forest management.**—(a) Thinning. Experiments with catalpa are being conducted on the 150-acre catalpa plantation of H. C. Rogers in Champaign County. This work was begun in 1916, and will be continued through a period of several years. (b) Experiments in the improvement and reconstruction of farm woodlands are being continued in cooperation with land owners in the various parts of the State.

5. **Wood utilization.**—(a) Investigations of the relative durability of tamarack fence posts were made and results published in the Monthly Bulletin for March, 1919. (b) Field data on the distribution of commercial timber by species and supplemental data on timber markets have been taken. The report is ready for publication. (c) Assistance was given Government contractors in the location of timber for munition purposes. (d) Utilization studies for the Miami Conservancy district were undertaken during the year, and estimates of the standing timber by species were furnished to the District.

8. **Municipal forestry.**—Cooperation with the cities of Cincinnati and Oberlin in the establishment of municipal forests is being continued. Under the direction of the Forester 400 acres of the open portions of the Cincinnati forest have been planted, requiring approximately 500,000 trees. The planting

stock was practically all grown in the municipal nurseries. The area comprising the Oberlin forest, acquired for the protection of potable water supplies (100 acres) is practically reforested, either by planting or artificial regeneration. The data for both phases will be valuable to northern Ohio in a few years.

9. **The State forests.**—Planting operations on the Dean and Waterloo Forests were continued. During the year 32,426 trees (mostly conifers) were planted at Dean, and 18,198 trees at Waterloo. In addition forest arboretums have been started on both tracts.

Publications.—*Monthly Bulletin*: "Woodlot Improvement and the Production of Firewood" (July, 1918), A. E. Taylor; "Meeting the Wood-fuel Situation" (October, 1918), Edmund Secrest; "War-time Uses of Timber" (November, 1918), Edmund Secrest; "Tree Memorials for Fallen Heroes" (February, 1919), Edmund Secrest; "Tamarack for Fence Posts" (March, 1919), J. J. Crumley.

HORTICULTURE

The main lines of work in this department have gone forward since the last report, but some have been curtailed.

The preservation of fruit juices has assumed greater importance and the work will be somewhat increased for this reason.

The supervision and care of the young apple orchards on the county experiment farms has been put into the hands of Mr. Ballou. Thus far the plan is working well and within a year or two considerable crops may be expected.

The seedling apple trees which were the result of crosses are in good condition but no fruit has as yet been secured.

The selection of the most desirable seedling strawberries, which are the result of crosses made in previous seasons, has not been completed.

The work in nomenclature of currant varieties has not been completed.

The diffculty of securing correctly-named varieties is particularly great in case of currants and peaches and there is much misnaming within all classes of fruit.

Work has been undertaken in the improvement of varieties of sweet corn at the suggestion of canning factory proprietors. Earrow tests of a considerable number of varieties are in progress.

Yields of bearing apple trees have been kept for a sufficient length of time to make a comparison of varieties as to productiveness possible. The results will be ready soon.

Results in the use of various fertilizers on the fruiting of strawberry plants give evidence of value. A preliminary report will be made soon.

Three greenhouses, covering 10,000 square feet of ground were completed the latter part of the winter, but not in time to be used

for regular crops. A trial of muskmelon varieties is in progress in these houses.

Some varieties suffered considerably from the extreme heat, but it appears as though results of value will be secured. Selections are made with this crop as in case of others.

Publications.—The following topics have been treated in the *Monthly Bulletin*: "Greenhouse-Grown Endive" (August, 1918), S. N. Green; "Using Fertilizers in the Greenhouse" (September, 1918), S. N. Green; "Transplant Peonies in September" (September, 1918), W. E. Bontrager; "More Varieties of Cultivated Plants Needed" (September, 1918), W. J. Green; "Household Use of Ohio Apples" (October, 1918), W. J. Green; "Storage of Grapes" (October, 1918), Paul Thayer; "Autumn Lawn and Flower Garden Work" (November, 1918), W. E. Bontrager; "The Hernito Grape" (December, 1918), Paul Thayer; "Orchard Fertilizing Experiments" (January, 1919), F. H. Ballou; "Choosing Gooseberry Varieties" (January, 1919), Paul Thayer; "Commercial Grape Growing" (February, 1919), Paul Thayer and W. J. Green; "Pruning Apple Trees" (February, 1919), C. W. Ellenwood and W. J. Green; "Selecting Ornamental Shrubbery" (February, 1919), W. E. Bontrager; "Using the Spray Gun" (February, 1919), I. P. Lewis; "Grafting and Budding Fruit Trees" (April, 1919), W. J. Green; "Simple Methods of Celery Culture" (April, 1919), W. J. Green.

NUTRITION

Dr. E. B. Forbes, chief of this department, served as a major in the Food and Nutrition Division of the Sanitary Corps, U. S. Army, from February 11, 1918, until March 20, 1919, the first 6 months in the United States and the last 8 in France. Dr. Forbes resumed his work at the Experiment Station on March 24, 1919. In his absence the work in nutrition was directed by Dr. J. O. Halverson. During the greater part of the year the investigational force was reduced from five men to two. The return of Dr. Forbes and the engagement of E. B. Wells has increased the number of workers to four.

Two investigations with animals were conducted, a metabolism experiment, the second on this subject, on the "Utilization of Calcium Compounds by Swine," and a feed-lot study on "Methods of Feeding Mineral Supplements to Pigs."

Publications.—Bulletin 330, "The Mineral Metabolism of the Milch Cow" (Third Paper), E. B. Forbes, J. O. Halverson, L. E. Morgan et al. *Monthly Bulletin*: "Feeding Mineral Supplements to Pigs" (April, 1919), J. O. Halverson. Publications in Scientific Journals: "The Mineral Metabolism of the Milch Cow," E. B. Forbes, Journal of Dairy Science, Vol. II, No. 1, January, 1919. "Thymol-Chloroform as a Urinary Preservative," J. O. Halverson and J. A. Schulz, Journal American Chemical Society, 41 (1919), 440.

SOILS

DIVISION OF SOIL TECHNOLOGY

The activities of the Division of Soil Technology for the past year have been along the following lines:

1. **Soil biology.**—The projects outlined in the annual report for 1917-1918 have been continued. Further work has been done upon nitrogen methods and apparatus.

The study of nitrification is being continued, and considerable time and attention have been given to studies of Azotobacter.

2. **Soil survey.**—The detail soil survey in cooperation with the Bureau of Soils, U. S. Department of Agriculture, is being continued. Due to the depletion of the staff, this work is progressing slowly.

Publications.—"The Determination of Total Nitrogen, Including Nitric Nitrogen," B. S. Davisson and J. T. Parsons, Journal Industrial & Engineering Chemistry, 11 (1919) 306; "An All-Glass Nitrogen Apparatus," E. R. Allen and B. S. Davisson, Annals Missouri Botanical Garden, 6 (1919) 45; "A Scrubber for Ammonia Distillation," B. S. Davisson, Journal Industrial & Engineering Chemistry, 11 (1919) 465; "Some Conditions Affecting the Growth and Activities of Azotobacter chroococcum," E. R. Allen, Annals Missouri Botanical Garden, 6 (1919).

DIVISION OF SOIL TREATMENT

The season of 1918 completed a quarter century's work at Wooster in the use of fertilizers and manure on corn, wheat and oats grown continuously on the same land; on the same crops grown in succession and followed by clover and timothy in a 5-year rotation, and on the 3-year rotation of potatoes, wheat and clover. The final results of this work, together with 23 years of similar work on the Northeastern Test Farm at Strongsville; 14 years each on the Southwestern and Southeastern Test Farms at Germantown and Carpenter, and 9 years at Findlay, are published in Bulletin 336.

Publications.—Bulletin 336, "The Maintenance of Soil Fertility—"A Quarter Century's Work With Manure and Fertilizers," C. E. Thorne and others. *Monthly Bulletin*: "Fertilizing the Wheat Crop" (July, 1918), C. E. Thorne; "How Often Shall We Lime?" (August, 1918), C. E. Thorne; "Fertilizing the Wheat Crop in Southwestern Ohio" (September, 1918), C. E. Thorne; "The Cost of Crop Production in Ohio" (November, 1918), C. E. Thorne; "Growing Clover for Soil Improvement" (December, 1918), F. E. Bear; "How Much Manure May Be Produced on a Farm?" (December, 1918), C. G. Williams; "Rotation of Dairy Farm Crops" (January, 1919), C. E. Thorne; "Can Ohio Farmers Afford to Buy Complete Fertilizers?" (March, 1919), C. E. Thorne; "Fertilizing the Corn Crop" (April, 1919), C. E. Thorne; "Availability of the Nitrogen in Garbage Tankage" (June, 1919), F. E. Bear and George Valley.

PUBLICATIONS

The Monthly Bulletin has been continued regularly and is now in its fourth volume. The twelve numbers for the year under review have contained 84 articles, representing all the research

departments of the Station. The function of this publication is to convey to the people in the briefest and simplest form compatible with clear statement the practical conclusions drawn from the Station's work, while the data upon which these conclusions are based are reserved for publication in the "Monograph" series, in which each number is devoted to the discussion of a single topic. Of this series the following numbers have been prepared during the year:

Bulletin 326—The Agriculture of Ohio. By W. A. Lloyd, J. I. Falconer and C. E. Thorne. This is a historical and statistical survey of the agriculture of the State, giving a general review of its early agriculture, a statistical summary of the crop production of the State as a whole, as shown by the statistics collected by the township assessors, and a summary of the same statistics for each county in the State. It is published as a separate volume from the regular Monograph series.

Bulletin 327—Clover vs. Alfalfa for Milk Production. By C. C. Hayden, pp. 1-36, July, 1918.

Bulletin 328—Livestock vs. Grain Farming. By C. G. Williams, pp. 37-53, July, 1918.

Bulletin 329—The Peach Tree Borer. By H. A. Gossard and J. L. King, pp. 55-87, September, 1918.

Bulletin 330—The Mineral Metabolism of the Milch Cow (Third Paper). By E. B. Forbes, J. O. Halverson, L. E. Morgan and others, pp. 89-134, September, 1918.

Bulletin 331—The Farmers' Elevator Movement in Ohio. By H. E. Erdman, pp. 135-160, November, 1918.

Bulletin 332—Forest and Shade Tree Insects in Ohio. By J. S. Houser, pp. 161-487, November, 1918.

Bulletin 333—Apple Blotch, a Serious Fruit Disease. By A. D. Selby, pp. 489-505, February, 1919.

Bulletin 334—Dairy Production in Ohio. By R. I. Grady and M. O. Bugby, pp. 507-541, February, 1919.

Bulletin 335—Effect of Age of Pigs on the Rate and Economy of Gains. By W. L. Robison, pp. 543-575, March, 1919.

Bulletin 336—The Maintenance of Soil Fertility—A Quarter Century's Work with Manure and Fertilizers. By C. E. Thorne and others, pp. 577-642, April, 1919.

Bulletin 337—Ohio Weather for 1918. By W. H. Alexander and C. A. Patton, pp. 647-737, June, 1919.

Bulletin 338—Thirty-eighth Annual Report, 1918-1919. Index. June, 1919.

Brief Press Bulletins have been issued weekly during the year.

IMPROVEMENTS

A new range of greenhouses has been constructed to replace the old houses built in 1894. The new range includes 3 houses and covers about 10,000 square feet. It is built in modern construction and located northwest of the present soils building, which it is proposed eventually to use as the office of the greenhouse.

The long delayed paving of the highway leading from Wooster past the Experiment Station to Applecreek village is being completed, and will be connected with the pavement constructed around the Station buildings several years ago.

The main roads across the Station farm are being macadamized.

PERSONNEL

The following changes in the personnel of the scientific staff of the Station have occurred during the year.

APPOINTMENTS

L. E. Thatcher, Ph. G., assistant in agronomy; R. C. Thomas, M. A., assistant in botany; Freda Detmers, M. S., assistant in botany; R. H. Simon, A. M., assistant in chemistry; E. B. Wells, B. S., assistant in nutrition; G. P. Becker, office assistant in farm management; L. T. Ball, assistant in farm management; R. H. Seever, manager, Southeastern Test Farm; C. H. Watson, manager, Southwestern Test Farm; W. H. Ruetenik, foreman, Northeastern Test Farm; E. W. Moore, foreman, Hamilton County Experiment Farm; H. R. Hoyt, superintendent, Paulding County Experiment Farm; McKinley Newton, foreman, Mahoning County Experiment Farm; J. K. Sites, foreman, Madison County Experiment Farm; C. L. Higinbotham, horticultural foreman, Hamilton County Experiment Farm.

TRANSFERS AND PROMOTIONS

D. C. Mote, parasitologist, from Department of Animal Husbandry to Department of Entomology.

J. Paul Markley, from superintendent of Northeastern Test Farm to superintendent Mahoning and Trumbull County Experiment Farms.

H. W. Rogers, from foreman Madison County Experiment Farm to superintendent Clermont and Hamilton County Experiment Farms.

RESIGNATIONS

C. A. Gearhart, assistant in agronomy; M. O. Bugby, superintendent Experiment Farms; D. C. Babcock, assistant in botany; J. A. Stenius, T. E. Richmond and G. E. Boltz, assistants in chemistry; R. I. Grady, assistant in dairying; J. R. Stear and D. C. Mote, assistants in entomology; E. R. Allen, associate in soil technology; S. N. Green, garden assistant; C. M. Timmons, office assistant in farm management; M. D. Moore, foreman Hamilton County Experiment Farm; R. H. Seever, manager Southeastern Test Farm; R. O. Botkin, herdsman in dairying; E. C. Morr, office assistant in agronomy; Lewis Schultz, foreman of the Southeastearn Test Farm.

DEATHS

Carl M. Runkle, foreman, Mahoning County Experiment Farm, was killed in an automobile accident June 27, 1918. Elton Mohn, assistant in farm management, died of influenza February 25, 1919. Both these men had rendered faithful and efficient service in their respective fields of work.

Respectfully submitted,

CHAS. E. THORNE,

Director.

REPORT OF THE BURSAR

HON. G. E. JOBE,

President of the Board of Control.

Sir: I respectfully submit the financial report of the Ohio Agricultural Experiment Station for the fiscal year ended June 30, 1919.

In statements A, B, C, D, E, F and G will be found a record of the receipts and expenditures from the various funds; statements A and B being statements of account with the appropriations received from the National Government and a copy of the report made to the Governor of the State, to the National Secretary of Agriculture, and to the National Secretary of the Treasury; statement C being a statement of account with the United States Produce Fund; statement D being a statement of the account with the State appropriations and Produce Fund; statement E being a statement of account with the Rotary Funds.

The five statements A, B, C, D and E are combined in statement F, which shows the total income and expenditures for the fiscal year.

Statement G is a balance sheet which shows the condition of each fund at the close of business, June 30, 1919.

Respectfully submitted,

W. H. KRAMER,

Bursar.

STATEMENT A

HATCH FUND

The Ohio Agricultural Experiment Station in Account with the United States Appropriation under the Hatch Act for 1918-19

Dr.

To receipts from the Treasurer of the United States, as per appropriation for the year ended June 30, 1919, as per act of Congress approved March 2, 1887	$15,000.00

Cr.

By expenditures for:		
Salaries	$5,902.80	
Forage supplies	2,137.71	
Fuel supplies	180.62	
Office supplies	182.88	
Agricultural supplies	784.50	
General plant supplies	402.08	
General plant materials	606.38	
General plant equipment	3,770.89	
Repairs	6.50	
Transportation	845.23	
Communication	106.81	
General plant service	53.60	
Contributions	20.00	
Total		$15,000.00

STATEMENT B

ADAMS FUND

The Ohio Agricultural Experiment Station in Account with the United States Appropriation under the Adams Act for 1918-19

Dr.

To receipts from the Treasurer of the United States, as per appropriation for the fiscal year ended June 30, 1919, as per act of Congress approved March 16, 1906	$15,000.00

Cr.

By expenditures for:		
Salaries	$7,724.83	
Forage supplies	1,507.40	
General plant supplies	569.17	
General plan materials	310.56	
Office equipment	300.00	
General plant equipment	4,548.22	
Repairs	39.82	
Total		$15,000.00

STATEMENT C

ADAMS PRODUCE FUND

The Ohio Agricultural Experiment Station in Account with the United States Produce Fund

Dr.

To Receipts

From Department of Nutrition	$1,296.13	
Total		$1,296.13
To balance forward July 1, 1918		2,979.08
Total		$4,275.21

Cr.

By Expenditures

Forage supplies	763.89	
General plant materials	62.17	
Livestock	485.97	
General plant service	5.25	
Total		$1,317.28
Balance forward		2,957.93
Total		$4,275.21

STATEMENT D

The Ohio Agricultural Experiment Station in Account with the State and Produce Funds

Dr.

From	State appropriations	$265,530.00
"	Department of Administration	543.01
"	Department of Agronomy	2,180.53
"	Department of Animal Husbandry	3.30
"	Department of Botany	151.70
"	Department of Chemistry	160.70
"	Department of Dairy	18.50
"	Department of Forestry	165.85
"	Department of Horticulture	8,106.07
"	Northeastern Test Farm	1,414.37
"	Northwestern Test Farm	322.11
"	Southeastern Test Farm	690.64
"	Southwestern Test Farm	541.66
	Total	$279,828.44
	To balance forward July 1, 1918	74,691.93
	Total	$354,520.37

Cr.

By Expenditures

For	Salaries	$109,610.39
"	Wages	48,641.08
"	Wages unclassified	144.59
"	Food supplies	3.00
"	Forage supplies	8,415.28
"	Fuel supplies	9,880.81
"	Office supplies	1,544.26
"	Cleaning supplies	122.50
"	Agricultural supplies	2,481.84
"	General plant supplies	4,412.54
"	General plant materials	4,407.63
"	Office equipment	770.40
"	Livestock	489.00
"	Wearing apparel	14.00
"	Educational equipment	1,058.28
"	General plant equipment	4,142.12
"	Repairs	737.13
"	Light, heat and power	166.16
"	Transportation	13,499.45
"	Communication	442.96
"	General plant service	469.56
"	Greenhouses	9,820.64
"	Addition to smoke stack	634.50
"	Fencing	907.50
"	Paving	1,881.58
"	Ditching machine	32.00
"	Rent	1,852.65
"	Insurance	72.00
"	Contributions	72.45
	Total	$226,726.30
	*State Treasury	14,298.44
	Lapsed to State Treasury	162.26
	By balance forward	113,333.37
	Total	$354,520.37

*Deposited in State Treasury to the credit of the General Revenue Fund.

STATEMENT E

Ohio Agricultural Experiment Station in Account with the Dairy and Animal Husbandry Rotary Funds

DAIRY ROTARY FUND

Dr.

To Receipts

From	Sale of livestock	$3,191.82	
"	Sale of milk and cream	7,231.73	
"	Sale of miscellaneous items	6.00	
	Total		$ 10,429.55
	To balance forward July 1, 1918		1,589.52
	Total		$ 12,019.07

Cr.

By Expenditures

For	Wages	$5,792.36	
"	Forage supplies	3,150.67	
"	Cleaning supplies	55.15	
"	General plant supplies	321.20	
"	Wearing apparel	43.00	
"	Educational equipment	5.00	
"	General plant equipment	129.30	
"	Transportation	30.00	
"	General plant service	100.34	
	Total		$ 9,627.02
	By balance forward		2,392.05
	Total		$12,019.07

STATEMENT E—Continued

ANIMAL HUSBANDRY ROTARY FUND

Dr.

To Receipts

From	Sale of bags	$ 44.83	
"	Sale of cattle	3,355.40	
"	Sale of corn	498.91	
"	Sale of eggs	3,762.56	
"	Freight	214.93	
"	Sale of hides	9.38	
"	Sale of hogs	8,192.66	
"	Sale of oilmeal	16.50	
"	Sale of poultry	642.16	
"	Refund on tankage	150.00	
"	Sale of sheep	3,232.52	
"	Sale of sheep pelts	20.04	
"	Sale of shavings	14.40	
"	Sale of wool	3,958.64	
"	Sale of miscellaneous items	3.11	
	Total		$24,116.04
	Balance forward		1,261.14
	Total		$25,377.18

Cr.

By Expenditures

For	Wages	$ 8,486.30	
"	Forage supplies	10,110.50	
"	Cleaning supplies	30.00	
"	Agricultural supplies	10.20	
"	General plant supplies	278.75	
"	General plant materials	79.70	
"	Livestock	497.20	
"	General plant equipment	155.36	
"	Transportation	202.93	
"	General plant service	106.92	
"	Insurance	1.00	
	Total		$19,958.86
	By balance forward		5,418.32
	Total		$25,377.18

STATEMENT F

Total Receipts and Expenditures of the Ohio Agricultural Experiment Station for the Year ended June 30, 1919

Dr.

To Receipts

From	United States appropriation	$ 30,000.00	
"	State appropriation	265,530.00	
"	Adams Produce Fund	1,296.13	
"	State Produce Fund	14,298.44	
"	Rotary Fund	34,545.59	
	Total		$345,670.16
	To balance forward July 1, 1918		80,521.67
	Total		$426,191.83

Cr.

By Expenditures

For	Salaries	$123,238.02	
"	Wages	62,919.74	
"	Wages unclassified	144.59	
"	Food supplies	3.00	
"	Forage supplies	26,085.45	
"	Fuel supplies	10,061.43	
"	Office supplies	1,727.14	
"	Cleaning supplies	207.65	
"	Agricultural supplies	3,276.54	
"	General plant supplies	5,983.74	
"	General plant materials	5,466.44	
"	Office equipment	1,070.40	
"	Livestock	1,472.17	
"	Wearing apparel	57.00	
"	Educational equipment	1,063.28	
"	General plant equipment	12,745.89	
"	Repairs	783.45	
"	Light, heat and power	166.16	
"	Transportation	14,577.61	
"	Communication	549.77	
"	General plant service	735.67	
"	Greenhouses	9,820.64	
"	Addition to smoke stack	634.50	
"	Fencing	907.50	
"	Paving	1,881.58	
"	Ditching machine	32.00	
"	Rent	1,852.65	
"	Insurance	73.00	
"	Contributions	92.45	
	Total		$287,629.46
	*State Treasury		14,298.44
	Lapsed to State Treasury		162.26
	Balance forward		124,101.67
	Total		$426,191.83

*Deposited in State Treasury to the credit of the General Revenue Fund.

STATEMENT G

BALANCE SHEET, JUNE 30, 1919

Date of appropriation	Appropriation titles	Balance July 1, 1918	Appropriation	Receipts transfers	Total	Lapsed to State Treasury	Expenditures	Balance June 30, 1919
1915-16	General plant supplies	$8.00			$8.00	$8.00		
	General plant materials	11.13			11.13	11.13		
	Livestock	75.00			75.00	75.00		
	General plant equipment	34.91			34.91	34.91		
	Contingencies	.09			.09	.09		
1916-17	Agricultural supplies	9.50			9.50	9.50		
	General plant supplies	6.70			6.70	6.70		
	Building materials	16.08			16.08	16.08		
	Additions and betterments	.85			.85	.85		
1917-18	Salaries	13,870.75			13,870.75			$13,870.75
	Wages	12,468.49			12,468.49			12,468.49
	Wages unclassified	500.00			500.00			500.00
	Food supplies	25.00			25.00			25.00
	Forage supplies	4,630.48			4,630.48		4,630.48	
	Fuel supplies	2,194.31			2,194.31		2,194.31	
	Office supplies	23.50			23.50		23.50	
	Cleaning supplies	47.93			47.93		47.93	
	Agricultural supplies	131.36			131.36		131.36	
	General plant supplies	2,801.94			2,801.94		2,801.94	
	General plant materials	74.13			74.13		74.13	
	Office equipment	369.67			369.67		369.67	
	Livestock	500.00			500.00		489.00	11.00
	Wearing apparel	13.87			13.87		13.87	
	Educational equipment	549.59			549.59		549.59	
	General plant equipment	346.50			346.50		346.50	
	Repairs	176.02			176.02		176.02	
	Light, heat and power	215.61			215.61		166.16	49.45
	Transportation	2,227.21			2,227.21		2,227.21	
	Transportation—Other	389.01			389.01		389.01	
	Communication	48.25			48.25		48.25	
	General plant service	10.45			10.45		10.45	
	Greenhouses	11,985.34			11,985.34		9,820.64	2,164.70
	Addition to smoke stack	800.00			800.00		634.50	165.50

BALANCE SHEET, JUNE 30, 1919—Continued

Date of appropriation	Appropriation titles	Balance July 1, 1918	Appropriation	Receipts transfers	Total	Lapsed to State Treasury	Expenditures	Balance June 30, 1919
1917-18	Printing warehouse	$10,000.00			$10,000.00			$10,000.00
	Water wells	500.00			500.00			500.00
	Fencing	1,200.00			1,200.00		$ 907.50	292.50
	Paving	4,066.95			4,066.95		1,881.58	2,185.37
	Ditching machine	32.00			32.00		32.00	
	Reservoir	1,500.00			1,500.00			1,500.00
	Rent	1,288.31			1,288.31		1,288.31	
	Insurance	43.00			43.00		43.00	
	Contributions	1,500.00			1,500.00		72.45	1,427.55
1918-19	Salaries		$131,040.00		131,040.00		109,610.39	21,429.61
	Wages		60,000.00		60,000.00		48,641.08	11,358.92
	Wages unclassified		500.00		500.00		144.59	355.41
	Food supplies		25.00		25.00		3.00	22.00
	Forage supplies		17,000.00		17,000.00		†4,000.00 3,784.80	9,215.20
	Fuel supplies		6,000.00	$†4,000.00	10,000.00		7,686.50	2,313.50
	Office supplies		1,650.00		1,650.00		1,520.76	129.24
	Cleaning supplies		200.00		200.00		74.57	125.43
	Agricultural supplies		2,300.00	†500.00	2,800.00		2,350.48	449.52
	Geneaal plant supplies		10,000.00		10,000.00		†500.00 1,610.60	7,889.40
	General plant materials		5,000.00		5,000.00		4,333.50	666.50
	Office equipment		500.00		500.00		400.73	99.27
	Livestock		1,500.00		1,500.00			1,500.00
	Wearing apparel		25.00		25.00		.13	24.87
	Educational equipment		1,200.00		1,200.00		508.69	691.31
	General plant equipment		6,000.00		6,000.00		3,795.62	2,204.38
	Repairs		500.00	†200.00	700.00		561.11	138.89
	Light, heat and power		350.00		350.00			350.00
	Transportation		15,000.00		15,000.00		†500.00 8,225.28	6,274.72
	Transportation—Other		2,500.00	†300.00	2,800.00		2,657.95	142.05
	Communication		400.00		400.00		394.71	5.29
	General plant service		500.00		500.00		459.11	40.89

BALANCE SHEET, JUNE 30, 1919—Concluded

Date of appropriation	Appropriation titles	Balance July 1, 1918	Appropriation	Receipts transfers	Total	Lapsed to State Treasury	Expenditures	Balance June 30, 1919
1918-19	Rent		$ 3 240.00		$ 3 240.00		$ 564.34	$2,675.66
	Insurance		100.00		100.00		29.00	71.00
	Adams Fund		15,000.00		15,000.00		15,000 00	
	Hatch Fund		15,000.00		15,000.00		15,000.00	
	Adams Produce Fund	$2,979.08		$ 1,296.13	4,275.21		1,317.28	2,957.93
	Rotary Fund	2,850.66		34,545.59	37,396.25		29,585,88	7,810.37
	Produce Fund			14,298.44	14 298.44		*14 298.44	
	Totals	$80 521.67	$295,530.00	$50,140.16 †5 000.00	$426,191.83 †5,000.00	$162.26	$287,629.46 †5,000.00 *14 298.44	$124 101.67

†Tranfers.
*Deposited in State Treasury to the credit of the General Revenue Fund.

APPENDIX

Monograph Bulletins

of the

Ohio Agricultural Experiment Station

for the year ended June 30, 1919

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*Cf. Monthly Bulletin, Vol. III, Nos. 7-12 and Vol. IV, Nos. 1-6.

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